ranslation

PCT/EP2003/003907

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 03SGL0180W0P	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP2003/003907	International filing date (*day/month/year*) 15 April 2003 (15.04.2003)	Priority date (*day/month/year*) 15 April 2002 (15.04.2002)
International Patent Classification (IPC) or national classification and IPC H01L 21/50		
Applicant SCHOTT AG		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 12 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 1-10 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand 22 October 2003 (22.10.2003)	Date of completion of this report 02 November 2004 (02.11.2004)
Name and mailing address of the IPEA/EP Facsimile No.	Authorized officer Telephone No.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/EP2003/003907

I. Basis of the report

1. With regard to the **elements** of the international application:*

☐ the international application as originally filed

☒ the description:
pages 1, 2, 4-27, as originally filed
pages _____, filed with the demand
pages 3, 3a, filed with the letter of 28 June 2004 (28.06.2004)

☒ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement under Article 19
pages _____, filed with the demand
pages 1-40, filed with the letter of 28 June 2004 (28.06.2004)

☒ the drawings:
pages 1/12-12/12, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

** Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).*

*** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-18, 21, 23, 24, 32, 36, 37	YES
	Claims	19-20, 22, 25-31, 33-35, 38-40	NO
Inventive step (IS)	Claims		YES
	Claims	1-40	NO
Industrial applicability (IA)	Claims	1-40	YES
	Claims		NO

2. Citations and explanations

1. Reference is made to the following documents:

D1: EP0280905
D2: US5895233
D3: XP10232226

1.1 Document D4 was not listed in the international search report. A copy of the document is attached.

D4: US4232814

2. Clarity, claims 1, 19, 24, 25, 26, 32, 34, 36 and 38

2.1 The groups of claims (1, 37, 39) and (19, 34, 38, 40) were drafted as separate, independent claims. However, they actually appear to refer to one and the same subject matter and clearly differ only in that they give different definitions of the subject matter for which protection is sought and in terms of the terminology used for the features of that subject matter. The claims are therefore not concise. Furthermore, the claims as a whole lack clarity, since the large number of independent claims makes it difficult, if not impossible, to

determine the subject matter for which protection is sought and therefore makes it unreasonably difficult for third parties to determine the scope of protection.

For this reason claims (1, 37, 39) and (19, 34, 38, 40) do not meet the requirements of PCT Article 6.

2.2 The category of claims 19, 20, 24, 25, 26, 32, 34, 36 and 38 is not clear, since those claims attempt to define a device in terms of process steps. This leaves the reader uncertain as to what is a "necessary" feature and what is not. It is doubtful whether it would be possible to tell from the final composite element what method was used to apply the binary system (vapour deposition, sputtering, etc.). If the method feature is deleted from claim 19 then the subject matter of the claim would lack novelty when compared with the teaching of D1 or D4. The same applies to the above device claims if the method features are deleted therefrom. These claims therefore fail to meet the requirements of PCT Article 6.

2.3 The features in claims 1, 19, 34, 36, 37, 38, 39 and 40 which follow the words "in particular" are optional features and have no restrictive effect on the scope of protection of those claims. Optional features should be formulated as dependent claims. These claims therefore fail to meet the requirements of PCT Article 6.

3. Inventive step, claims 1, 36, 37

3.1 D1 (column 4, lines 47 to 58; figures 2 and 7)

describes a method for connecting at least two substrates (10, 12), said method comprising the following steps:

- preparation of a first substrate (10);
- production of a frame-like connecting element (32) in the form of a frame on a first surface of the first substrate (10), a binary system, a glass or a glass-like material being used for the frame and the binary material system, glass or glass-like material being applied by sputtering;
- preparation of a second substrate (12); and
- connecting of the first (10) and second (12) substrates using the connecting element, a cavity (38) being formed inside the frame between the first and second substrates.

3.2 To a person skilled in the art, sputtering and vapour deposition are two alternative PVD methods. Said person would readily use a vapour deposition method to produce the glass layer in D1 (see D3).

3.3 Consequently, claims 1, 36 and 37 appear not to meet the requirements of PCT Article 33(3).

4. Novelty, claims 19, 34, 38, 39, 40

4.1 Novelty, claims 19, 34 and 38

4.1.1 D1 (column 4, lines 47 to 58; figures 2 and 7) discloses a composite element comprising a first substrate (10), a connecting element (32) on a first surface of the first substrate (10), the connecting element (32) being a frame consisting of a binary system, a glass or a glass-like material, and a

second substrate (12), the first (10) and second (12) substrates being connected by means of the connecting element (32). Consequently, claims 19, 34 and 38 appear not to meet the requirements of PCT Article 33(2).

4.1.2 D4 (column 3, lines 60 to 63; figure 1) uses an Au-Sn alloy (binary system). D4 thus prejudices the novelty of claims 19, 34 and 38. D2 uses a solder tin. Conventional solder tin consists of a binary system (e.g. Pb-Sn) and therefore D2 is prejudicial with regard to inventive step with respect to claims 19, 34 and 38.

4.2 Novelty, claims 39 and 40

4.2.1 D4 (claim 1, figure 1) implicitly discloses a method for connecting at least two substrates, said method comprising the following steps:

- preparation of a first substrate (10), production of a connecting element (11) on a first surface of the first substrate, and connecting of the first and second substrates (implicit) using the connecting element (11), a plurality of frames nested one inside the other being produced as connecting element.
  Consequently, claim 39 appears not to meet the requirements of PCT Article 33(2).

4.2.2 D4 also describes the object produced by the method as per claim 39. Consequently, claim 40 appears not to meet the requirements of PCT Article 33(2).

5.0 Dependent claims 2 to 18, 20 to 33 and 35 do not contain any features which, in combination with the

features of any claim to which they refer, meet the PCT requirements for novelty and inventive step. The reasons are as follows:

5.1 D1 (column 4, lines 47 to 58; figure 7) indicates that the connecting element (32) is applied by sputtering as a frame to the first surface of the first substrate. To a person skilled in the art, sputtering and vapour deposition are alternative PVD methods. Said person would readily use a vapour deposition method to produce the glass layer in D1 (see D3). Consequently, claims 2 to 4 appear not to meet the requirements of PCT Article 33(3). In addition, claim 20 appears not to meet the requirements of PCT Article 33(2) owing to the lack of clarity specified under point 2.2.

5.2 D2 (column 2, lines 21 to 25; column 4, lines 53 to 57) describes a method in which within the connecting element (16, 16a) one or more support elements (43) are produced on the first surface of the first substrate. A person skilled in the art would readily use the spacer from D2 in D1 in order to control spacing during bonding. Consequently, claim 5 appears not to meet the requirements of PCT Article 33(3). In addition, claim 21 appears not to meet the requirements of PCT Article 33(3) owing to the lack of clarity specified under point 2.2 and the general technical knowledge indicated under point 4.1.2 in relation to D2.

5.3 A person skilled in the art would readily use the double glazing principle in order to seal a cavity from the exterior (as in D1, for example). Consequently, claim 6 appears not to meet the

requirements of PCT Article 33(3). D4 (claim 1; figure 1) discloses a connecting element comprising a plurality of frames nested one inside the other. Consequently, claim 22 appears not to meet the requirements of PCT Article 33(2) owing to the lack of clarity specified under point 2.2 and considering point 4.1.2 in relation to D4.

5.4 D1 (column 4, lines 47 to 58) describes a method in which the step of producing the connecting element includes the deposition by sputtering of a binary system (borosilicate). To a person skilled in the art, sputtering and vapour deposition are alternative PVD methods. Said person would readily use a vapour deposition method to produce the glass layer in D1 (see D3). Consequently, claim 7 appears not to meet the requirements of PCT Article 33(3).

5.5 D2 (column 2, lines 50 to 62; figures 8(a) to 8(g)) describes a method in which the binary connecting element consisting of a binary system (solder tin, e.g. Pb-Sn) is deposited by sputtering and structured using a mask (lift-off technique). A person skilled in the art would readily use this method to structure the glass connecting element (32) in D1. Consequently, claims 8 and 9 appear not to meet the requirements of PCT Article 33(3). In addition, claims 23 and 24 appear not to meet the requirements of PCT Article 33(3) owing to the lack of clarity specified under point 2.2 and the general technical knowledge indicated under point 4.1.2 in relation to D2.

5.6 D1 (claim 1; figure 3) indicates that the connecting element and the second substrate are bonded. D2

(column 2, lines 50 to 62) indicates that the connecting element and the second substrate are soldered. To a person skilled in the art, both are normal methods for hermetically connecting together two substrates. Consequently, claim 10 appears not to meet the requirements of PCT Article 33(3). In addition, claim 25 appears not to meet the requirements of PCT Article 33(2) owing to the lack of clarity specified under point 2.2.

5.7 D1 (claim 1; figure 3) indicates that the connecting element and the second substrate are connected by means of anodic bonding. Consequently, claim 11 appears not to meet the requirements of PCT Article 33(3). In addition, claim 26 appears not to meet the requirements of PCT Article 33(3) owing to the lack of clarity specified under point 2.2.

5.8 D1 (claim 1; figure 1) describes a method in which the first (10) and the second (12) substrates comprise, respectively, a first and a second wafer, a number of laterally adjacent connecting elements (32) being produced on the first surface of the first wafer and, following connection of the first and second wafers to form a wafer composite, the wafer composite being divided into individual chips. Consequently, claim 12 appears not to meet the requirements of PCT Article 33(3). In addition, claim 27 appears not to meet the requirements of PCT Article 33(2) owing to the lack of clarity specified under point 2.2.

5.9 D1 (column 6, lines 4 to 14) describes a method according to claim 1, in which an hermetic cavity is formed within the frame between the first and second

substrates. Consequently, claim 13 appears not to meet the requirements of PCT Article 33(3). In addition, claims 28 and 29 appear not to meet the requirements of PCT Article 33(2) owing to the lack of clarity specified under point 2.2.

5.10 D1 (figures 6 and 7) describes a method according to claim 1, in which printed conductors (54) are disposed on the first surface of the first substrate and the connecting element (32) is deposited by sputtering onto the first surface such that the printed conductors (54) are at least partly covered. To a person skilled in the art, sputtering and vapour deposition are alternative PVD methods. Said person would readily use a vapour deposition method to produce the glass layer in D1 (see D3). Consequently, claim 14 appears not to meet the requirements of PCT Article 33(3). In addition, claim 30 appears not to meet the requirements of PCT Article 33(2) owing to the lack of clarity specified under point 2.2.

5.11 D1 (figures 6 and 7) indicates that the printed conductors (54) extend laterally and vertically through the connecting element. Consequently, claim 15 appears not to meet the requirements of PCT Article 33(3). In addition, claim 31 appears not to meet the requirements of PCT Article 33(2) owing to the lack of clarity specified under point 2.2.

5.12 A person skilled in the art would readily planarise the glass layer to obtain optimum conditions for the anodic bonding. Consequently, claims 16 and 32 appear not to meet the requirements of PCT Article 33(3).

5.13 D1 (column 5, lines 45 to 49; column 7, lines 7 to 15) describes a method according to claim 1, in which adjusting elements are produced on the first or on a second surface of the first substrate, the second surface lying opposite the first surface. Consequently, claim 17 appears not to meet the requirements of PCT Article 33(3). In addition, claim 33 appears not to meet the requirements of PCT Article 33(2) owing to the lack of clarity specified under point 2.2.

5.14 D1 (figures 6 and 7) describes a method according to claim 1, in which a number of substrates (10, 12) are combined to form a stack. Consequently, claim 18 appears not to meet the requirements of PCT Article 33(3). In addition, claim 35 appears not to meet the requirements of PCT Article 33(2) owing to the lack of clarity specified under point 2.2.